

Wireless Wearable Dry EEG System providing a Non-Invasive way of Diagnosing Seizure Disorders



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Interview conducted by:
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CEO CFO: Mr. Elconin, what is the concept behind Cognionics?

Mr. Elconin: We make a new kind of EEG system. EEG is measurement brainwaves.

Today, conventional EEG is used primarily by neurologists to diagnose and treat seizure-related disorders like epilepsy. Traditional EEG systems use what are called wet electrodes that require users to apply a gel on the head in order to make a good electrical contact between the scalp and the sensors. If you visited went into a neurologist today for a seizure diagnosis, they would spend 20-40 minutes getting your EEG system set up, take a 15 minute reading, then spend another 20 minutes cleaning up the mess.

With our system, you place a headset on your head, it wirelessly sends your data to the computer, and when you're done this just take it off. Unfortunately the system is not yet approved by the FDA for medical use. In the meantime, fortunately for us, there is a great deal of interest in using EEG to non-invasively measure what is happening in your brain and using this information for diagnosis and treatment of non-seizure disorders - everything from Traumatic Brain Injury (TBI) to Autism. In addition, there is growing interest in using brainwaves to control things via computer, referred to as Brain Computer Interface (BC). But all these applications are still in development. and in the meantime we sell our systems to the researchers doing this work.

CEO CFO: What have you developed at Cognionics?

Mr. Elconin: EEG has been around for almost 100 years, but dry EEG is hard to do. The actual EEG signal is very small and the skull is a great insulator. Almost everything interferes with the signal - breathing, motion, ambient electrical field from other equipment and lights, static electricity, even heart beat (ECG). To get anything useful, we need the electronics, the materials, and the mechanical systems that hold the sensors in place to all be perfect. That's what we do, arguably better than anyone. Our products today allow scientists around the world (we have shipped to over 50 countries) to collect better data easier and at less cost. We hope that in the not too distant future our systems will replace conventional EEG.

CEO CFO: What is the science that allows you not to need gel?

Mr. Elconin: The problem with EEG is that it is an extremely weak electrical field. Many people are familiar with EKG (also known as ECG) for measuring the heart EEG is very similar - rather than measuring nerves stimulating heart muscles, we are measuring the firing of neurons in waves across the surface of the brain. The problem is that the signal in the brain is about 1000 times weaker than the signal that you get from the heart.

When you use a wet system, the electrodes are attached with a sticky gel to the scalp. When you use a dry system, the electrodes just sit there and they need to be held on to the scalp some way. Furthermore, as I mentioned before, the electrical signal is not very strong. When we first started our company, we thought that the solution was better amplifiers, and indeed you need very good amps. But the problem is not just the strength of the signal, it is the relative strength of the noise - what we call Signal to Noise Ratio (SNR). Amps jack up both so SNR does not change. So in addition, our IP is around methods to reduce the noise. We do that with novel materials and mechanical designs.

CEO CFO: You mentioned that your system is being used in research. How do you make a leap to general usage?

Mr. Elconin: Research is a decent sized market. But as I said, we really want to have this approved for medical use. At this time, as far as I know, there are no medically approved dry EEG systems. The reason is the two main regulatory regimes, the FDA in the US and the CE marking in Europe, have in effect (it is a little more complicated than this) taken the stance that in order to get approved for medical use, we have to prove to their satisfaction, using data from clinical studies that we have to run, that doctors will be able to make the same diagnoses and decisions with dry systems that they can with conventional wet systems. Those studies are time consuming and expensive, and it is not easy to make them completely blinded. These are complex issues but we are working through them and are hopeful we will have something in two or three years.

CEO CFO: What has been the response from doctors?

Mr. Elconin: There are two ways to answer that. For detecting and diagnosing seizure disorders, current EEG systems work okay. Yes, neurologists would like something easier and faster, but current technology works. But some of these new applications I talked about earlier, they won't be practical if they involve lengthy prep time by trained technicians. The doctors doing the research into these applications understand full well that new technology will be required. They are excited.

CEO CFO: Would you tell us about the products you offer today?

Mr. Elconin: As I mentioned, we're focused on researchers and product development, and they need a variety lot of different things. We have high density systems for "major" research, a medical-like device that is super easy to use, a headband, systems for sleep studies, systems for children. We also design and build custom systems for companies (often other start-ups) developing products for the consumer market.

CEO CFO: Is it frustrating for you, knowing you have something that could help a lot more people but it just cannot get there yet? How do you deal with that?

Mr. Elconin: It is frustrating. In fact, there is a currently a segment of seizure disorder work where it would be useful today. Patients with Autistic Spectrum Disorder have been found to have a much higher incidence of seizures than the general population, but it can be very difficult to get an autistic subject to put up all the fuss of a conventional wet EEG. They are so difficult to do that even studying the problem is difficult. Interestingly, there are no standards for what constitutes a good enough wet EEG signal. The FDA allows that doctors can look at the data they get from a wet system and decide whether it's good enough. Doctors do this today. They could do this just as well with a dry system, but they are not allowed to. So yes, it's frustrating.

CEO CFO: What should readers remember most about Cognionics?

Mr. Elconin: We have a new kind of EEG system, enabling researchers to collect better data and develop new ways to diagnose and treat people. Our systems are going to play a significant role in healthcare and consumer devices in the years to come.

